

# ***The 1/12° global HYCOM real-time nowcast/forecast system***

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***Ocean Sciences Meeting  
2-7 March 2008  
Orlando, Florida***

Report Documentation Page			Form Approved OMB No. 0704-0188		
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1. REPORT DATE <b>MAR 2008</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-2008 to 00-00-2008</b>	
4. TITLE AND SUBTITLE <b>The 1/12degree global HYCOM real-time nowcast/forecast system</b>			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S)			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Naval Research Laboratory,Stennis Space Center,MS,39529</b>			8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR'S ACRONYM(S)		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>18</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

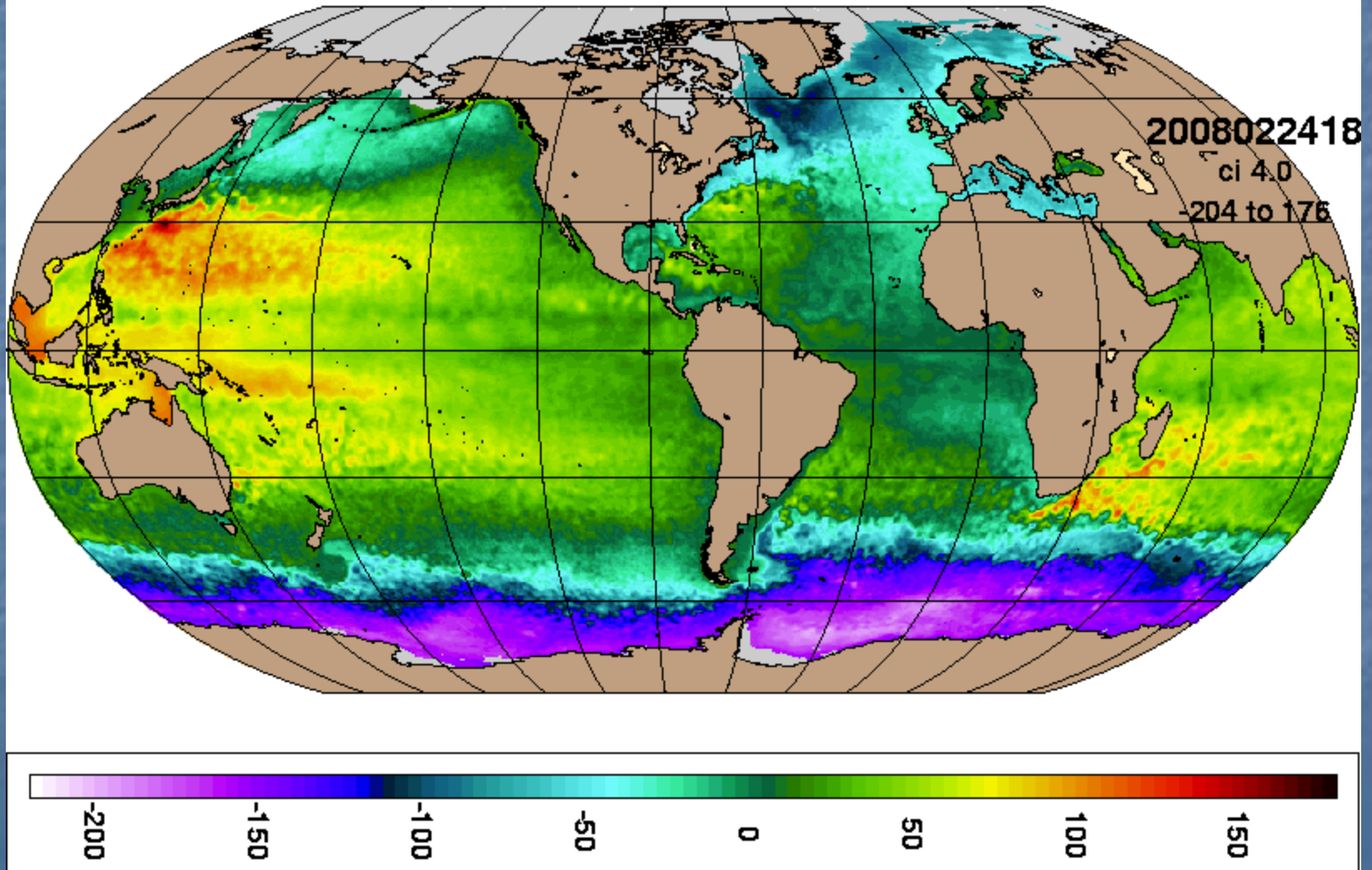
# ***1/12° Global HYCOM Configuration***

- Horizontal grid: 1/12° equatorial resolution
  - 4500 x 3298 grid points, ~6.5 km spacing on average, ~3.5 km at pole
- Mercator 79°S to 47°N, then Arctic dipole patch
- Vertical coordinate surfaces: 32 for  $\sigma_2^*$
- KPP mixed layer model
- Thermodynamic (energy loan) sea-ice model
- Surface forcing: **FNMOG NOGAPS 0.5° wind stress, wind speed, thermal forcing, and NOGAPS 1.0° precipitation**
- Monthly river runoff (986 rivers)
- Initialize from January climatology (GDEM3) T and S, then SSS relaxation from PHC 3.0
  - No subsurface relaxation to climatology

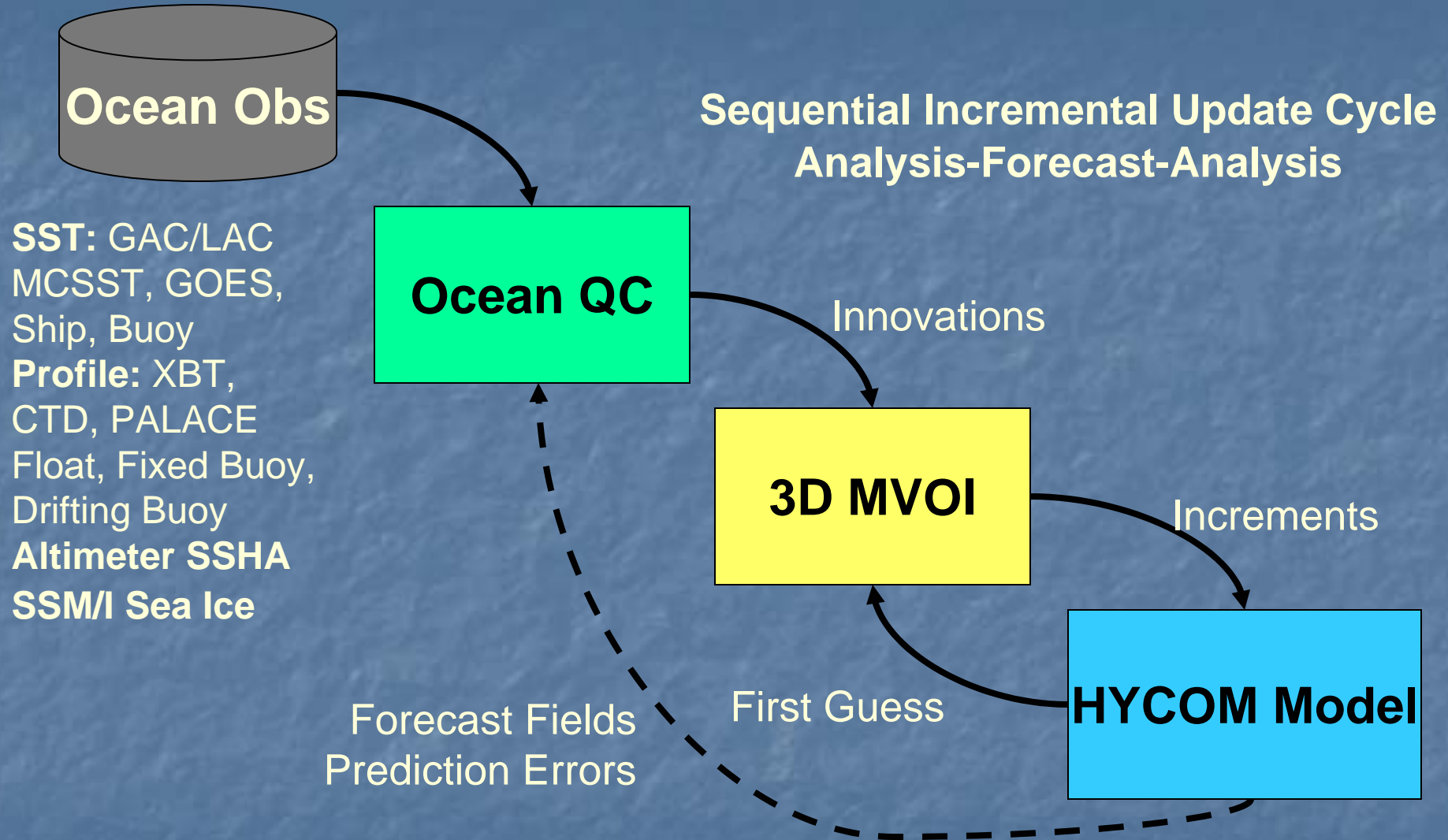
# *1/12° Global HYCOM*

Real time run started 22 December 2006

SSH date: Feb 20, 2008 90.4



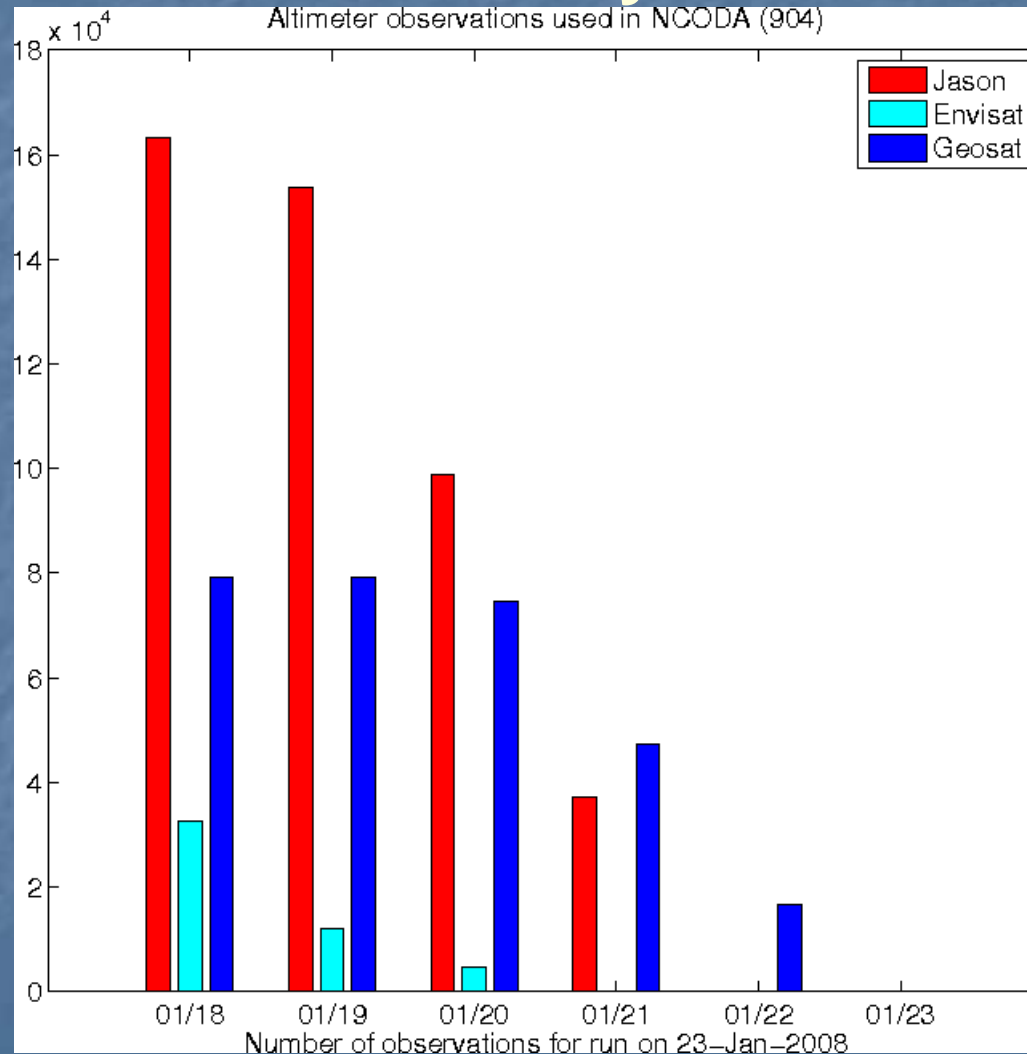
# *Navy Coupled Ocean Data Assimilation (NCODA)*



**MVOI - simultaneous analysis 6 ocean variables temperature, salinity, geopotential, layer pressure, velocity (u,v)**

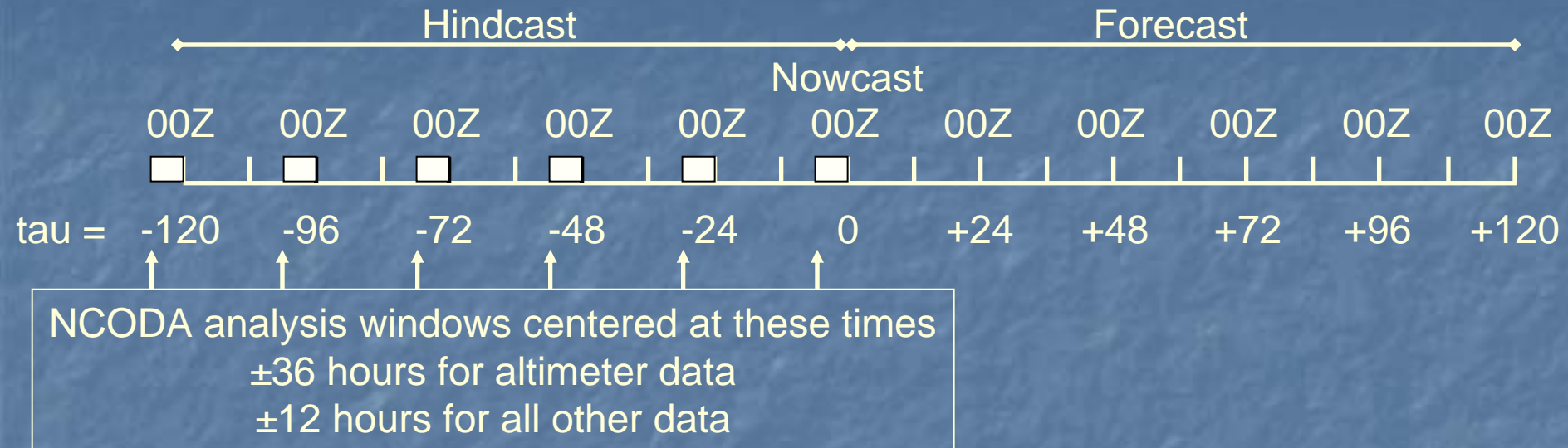
# Available altimeter data

## 23 January 2008





# HYCOM/NCODA Runstream



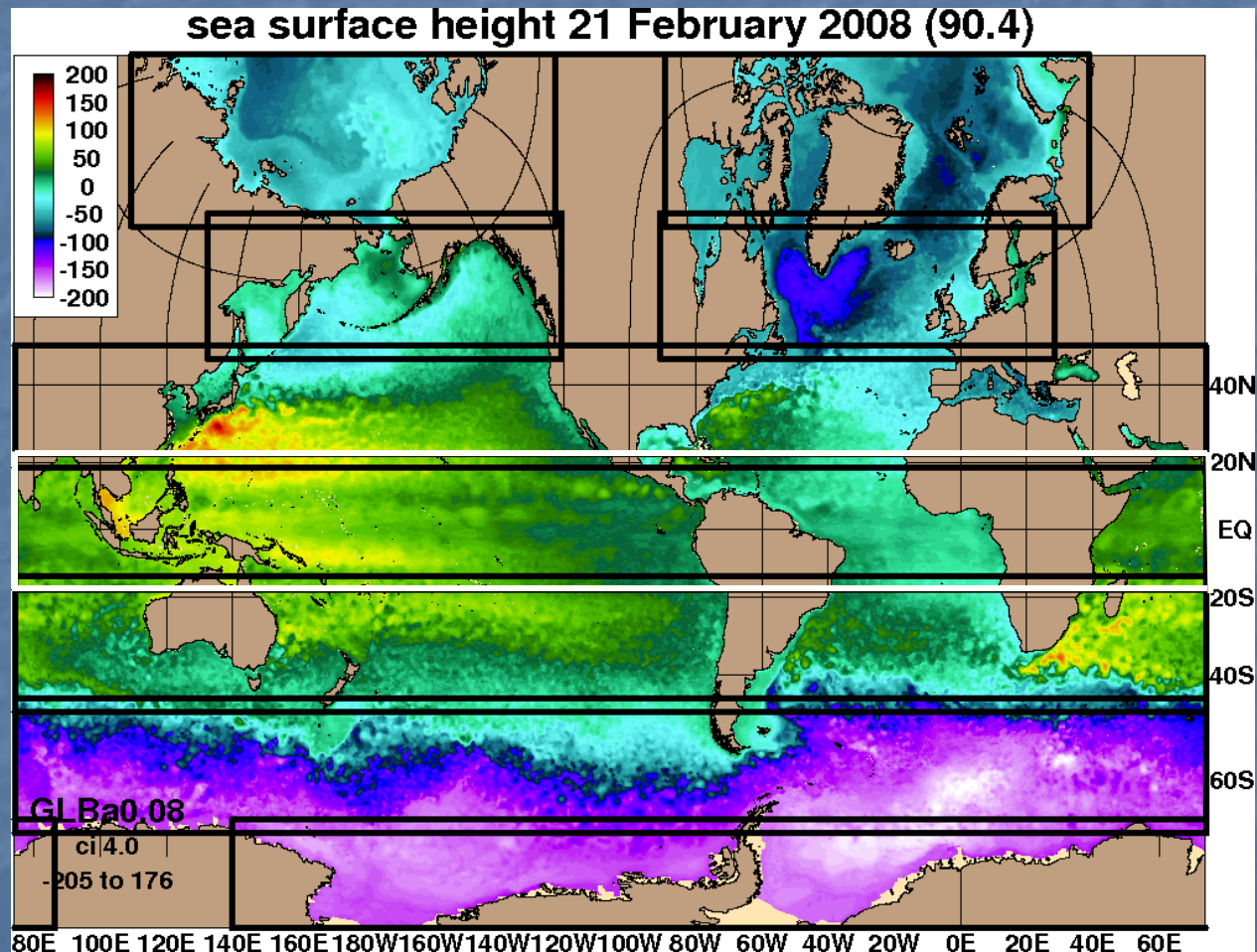
- 1) Perform first NCODA analysis centered on tau = -126
- 2) Run HYCOM for 24 hours using incremental updating (■) over the first 6 hrs
- 3) Repeat steps 1) and 2) until the nowcast time
- 4) Run HYCOM in forecast mode out to tau = 120

Approximate run times\* (using 379 IBM Power 5+ processors):

- 1) Six NCODA analyses: 1.1 hrs/analysis = 6.6 hrs
- 2) Five HYCOM hindcast days @ 240 sec  $\Delta t$ : 0.8 hrs/day = 4.0 hrs
- 3) Five HYCOM forecast days @ 240 sec  $\Delta t$ : 0.8 hrs/day = 4.0 hrs
- 4) Total: 14.6 hrs

\* Timings do not include PIPS coupling

# Data Assimilation Subregions Overlaid on SSH valid on 21 February 2008

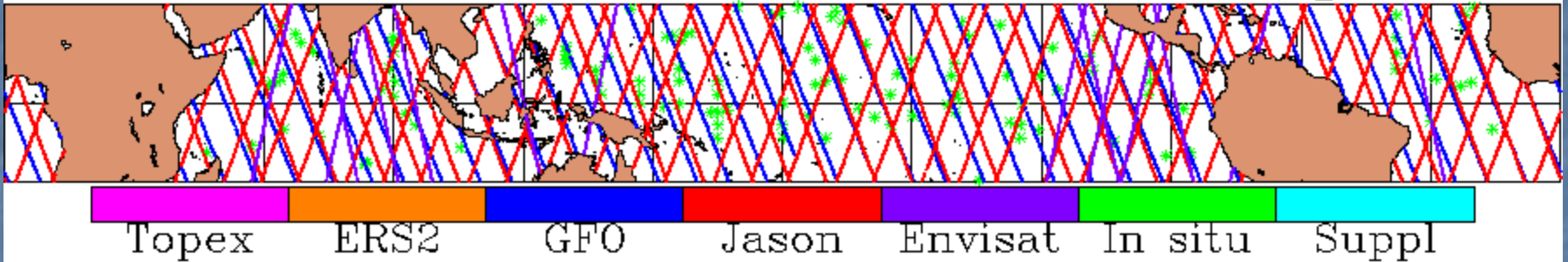




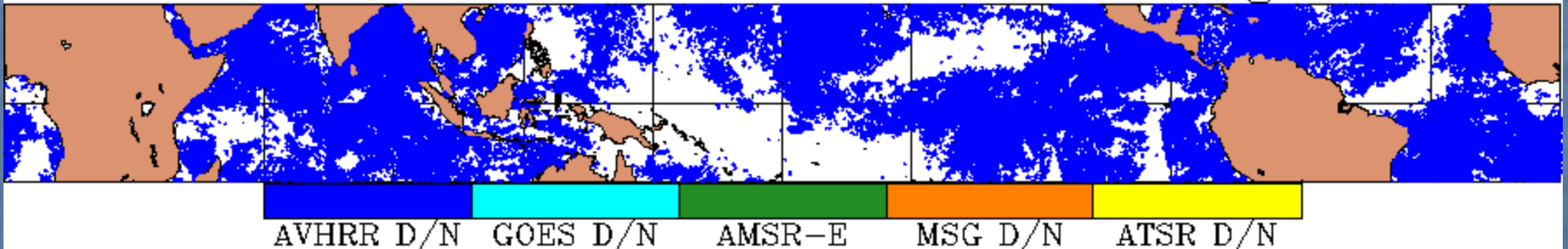
# NCODA Observation Locations

19 January 2008

SSH Observations 19 Jan 08 18Z 9 km grid

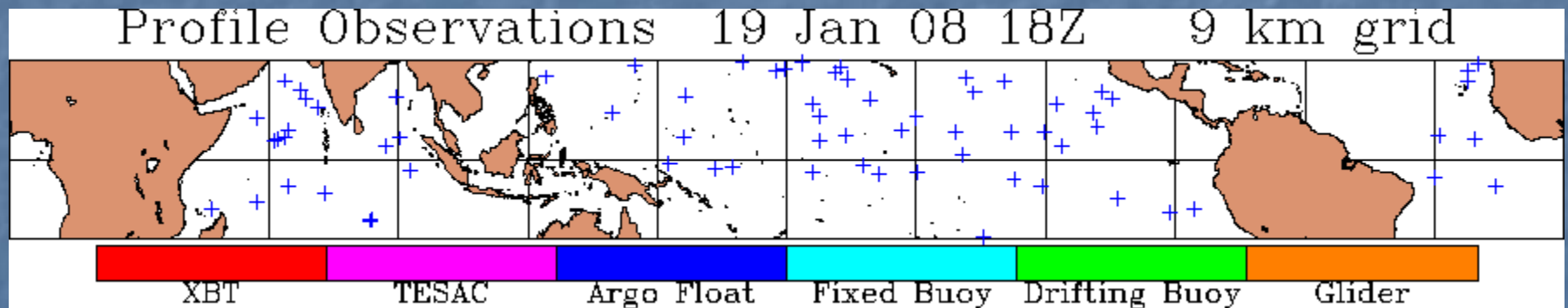
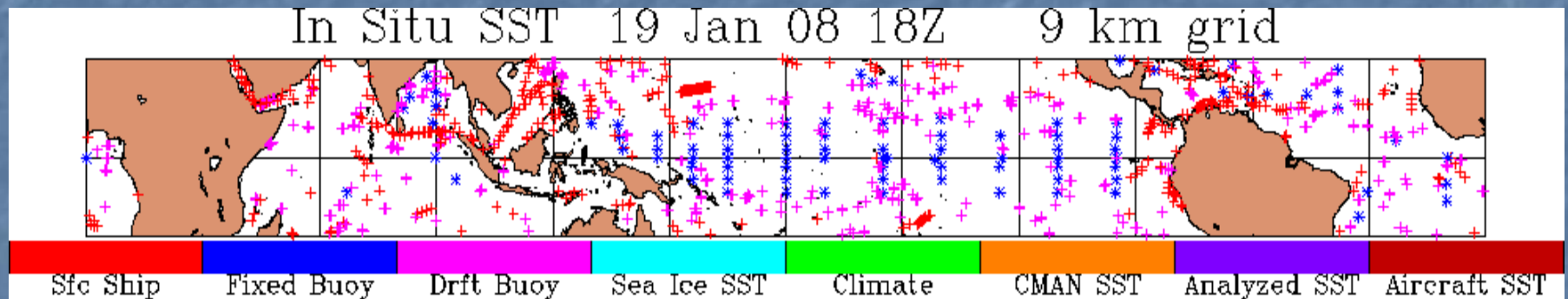


Satellite SST 19 Jan 08 18Z 9 km grid



# NCODA Observation Locations

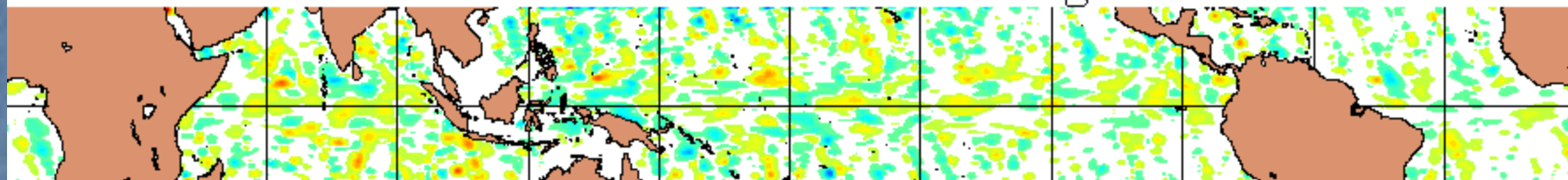
19 January 2008



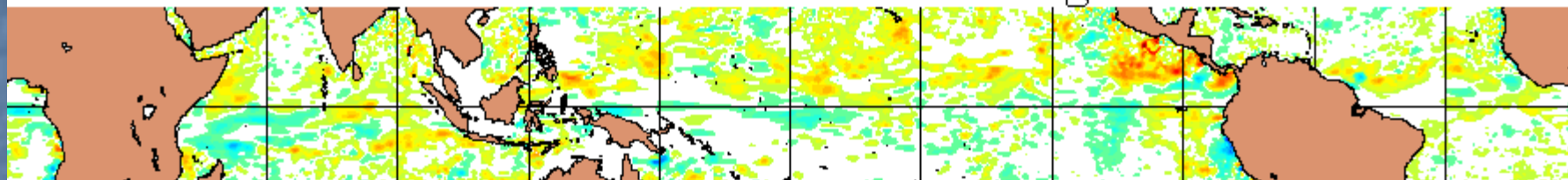
# Sea Surface Height and Sea Surface Temperature Increments

19 January 2008

SSH Analyzed Increment (M)  
19 Jan 08 18Z 9 km grid



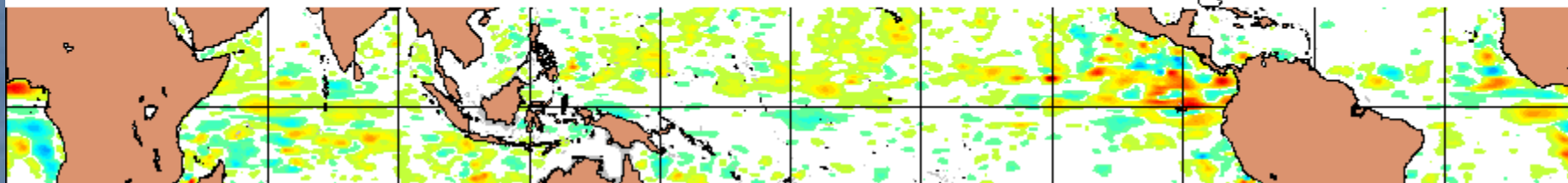
SST Analyzed Increment (C)  
19 Jan 08 18Z 9 km grid



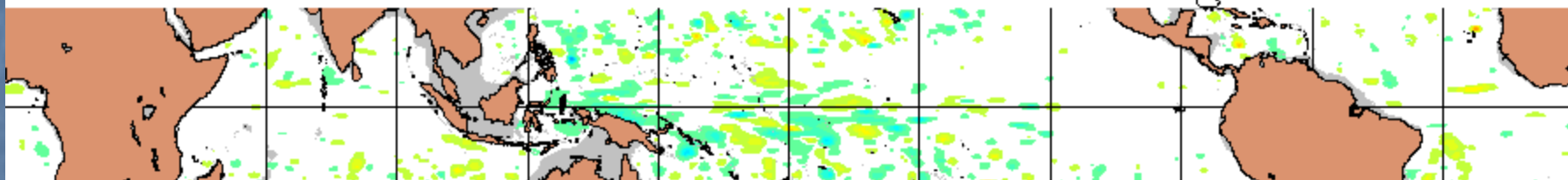
# Temperature Increments

19 January 2008

Temperature Analyzed Increment (C) 36 M Depth  
19 Jan 08 18Z Tau 000 9 km grid

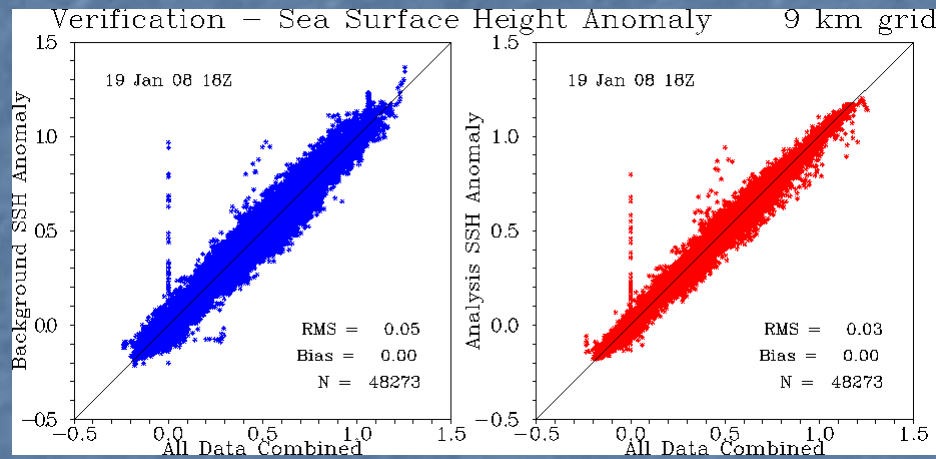


Temperature Analyzed Increment (C) 300 M Depth  
19 Jan 08 18Z Tau 000 9 km grid

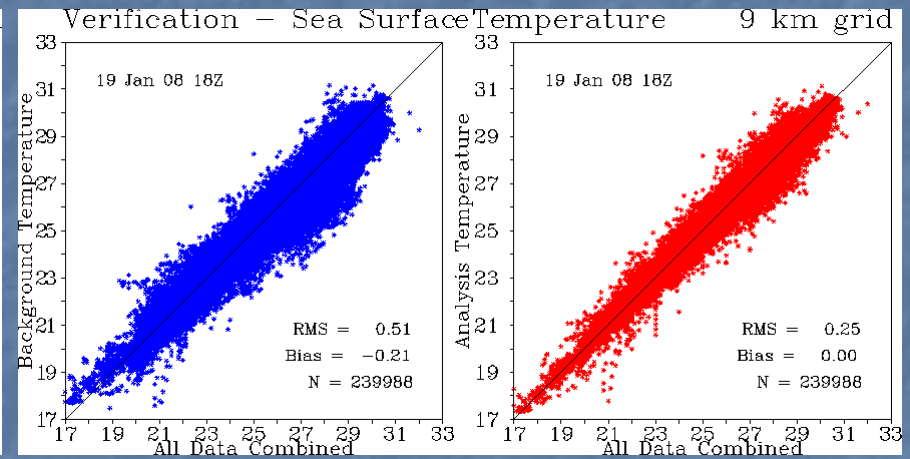


# NCODA verification

## SSH verification



## SST verification

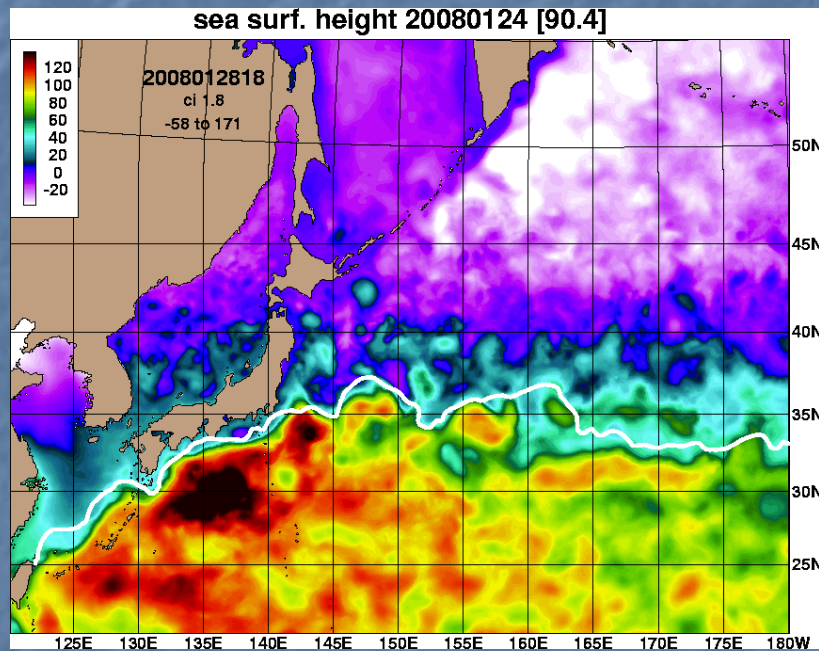




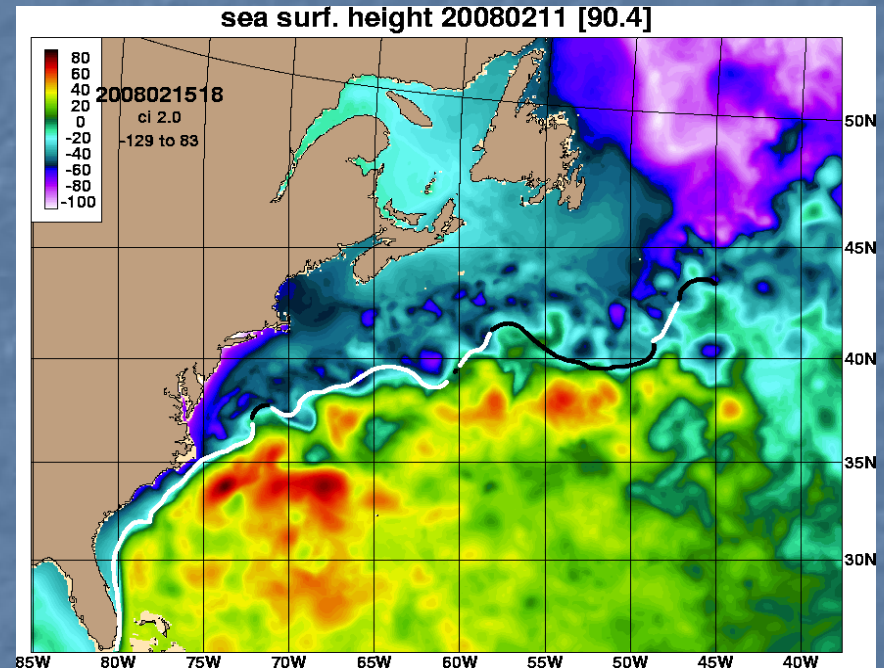
# Data Assimilation in Global HYCOM

## Gulf Stream and Kuroshio SSH with SST-based frontal analysis overlaid

24 January 2008



2 February 2008

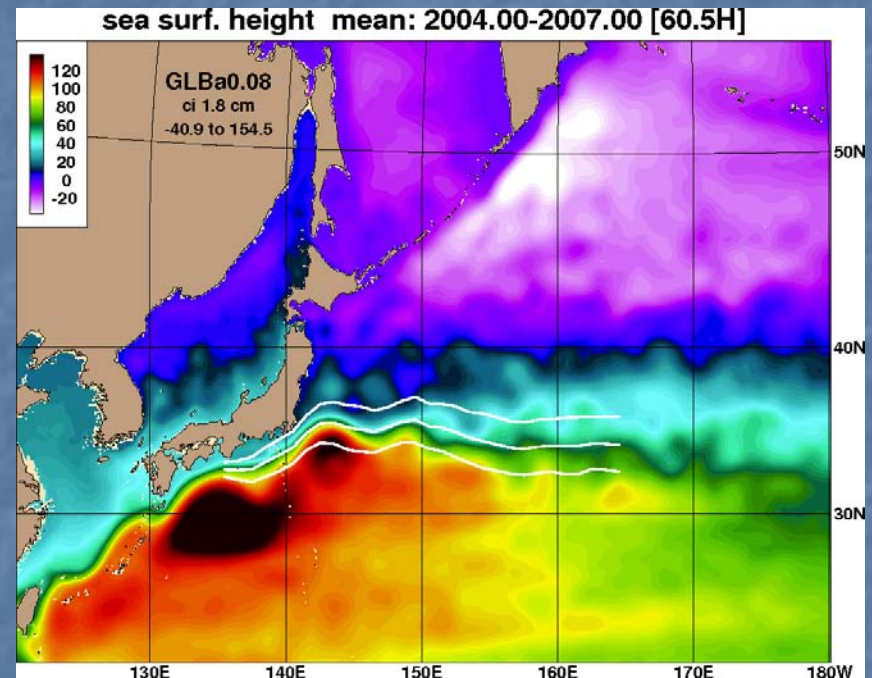
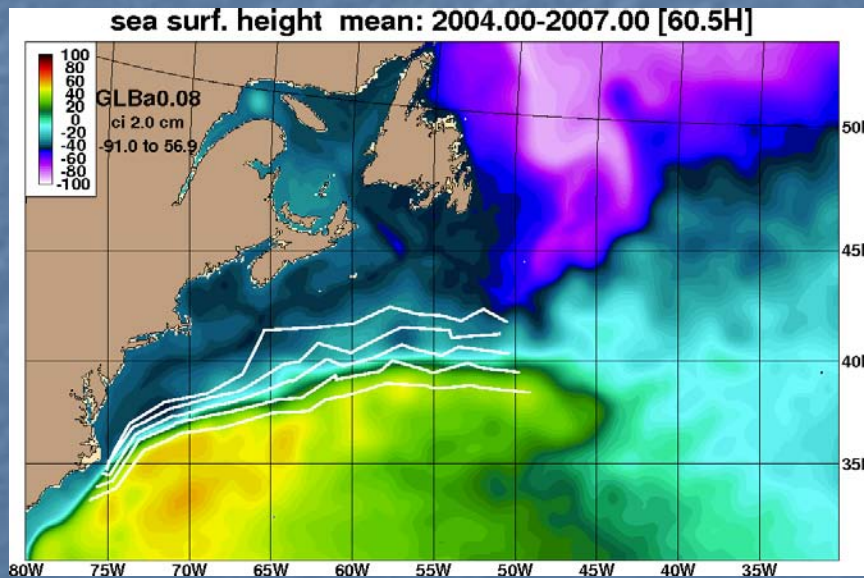


Frontal analysis < 4 days old = white,  
analysis  $\geq$  4 days old = black

# *1/12° Global HYCOM*

## *2004-2006 Mean SSH*

### *Gulf Stream and Kuroshio region*

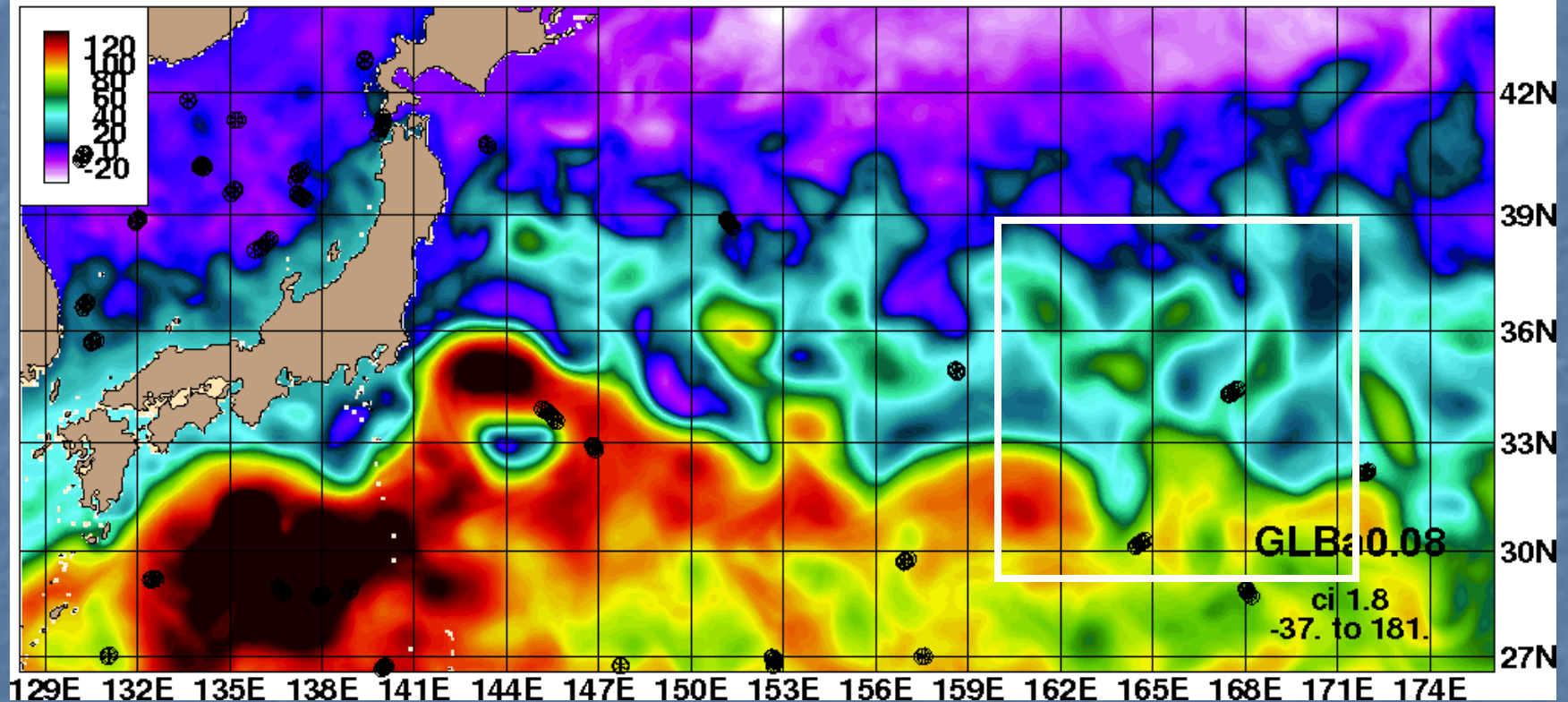


White lines are the mean position and  $\pm 1$  stdv

# 1/12° Global HYCOM

SSH and surface drifters

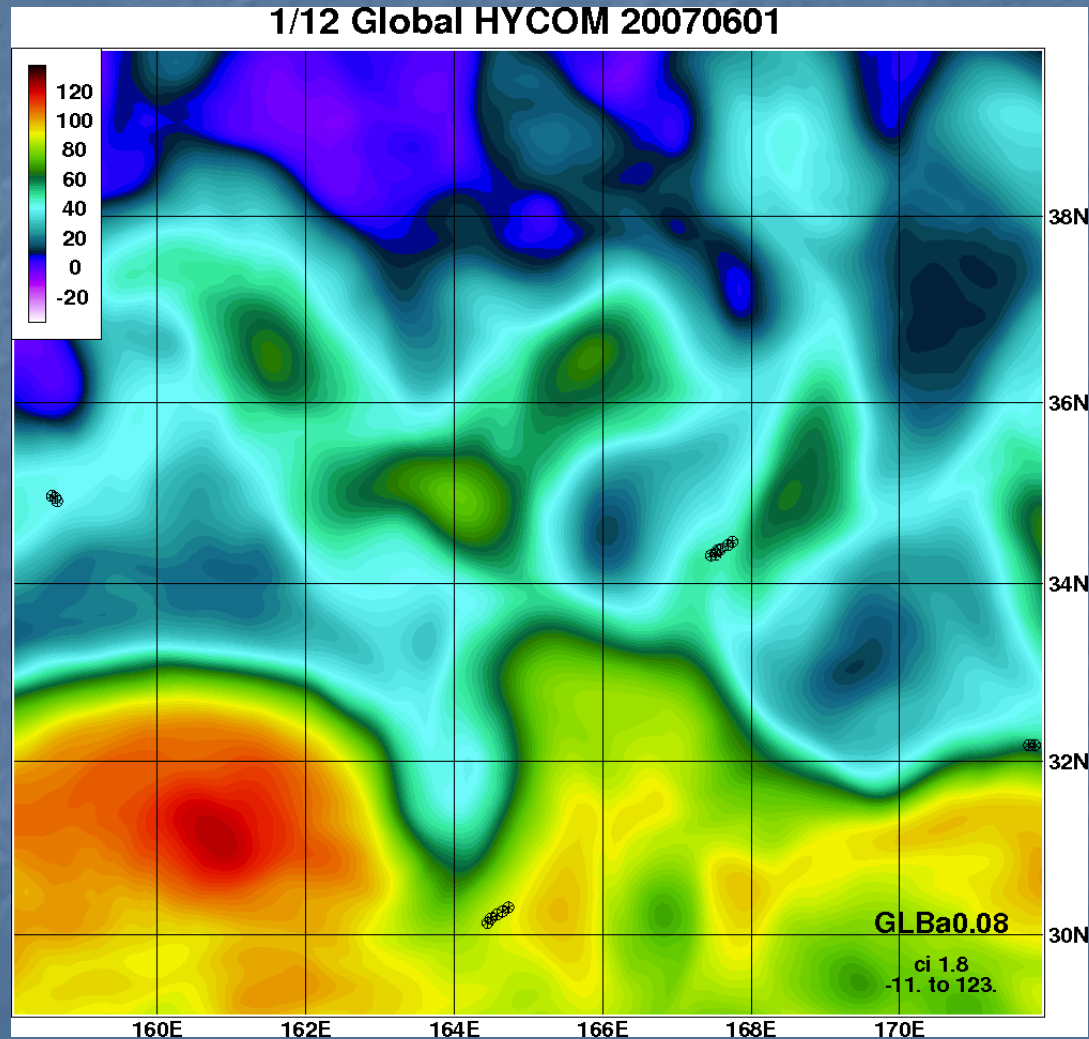
1/12 Global HYCOM 20070601





# 1/12° Global HYCOM

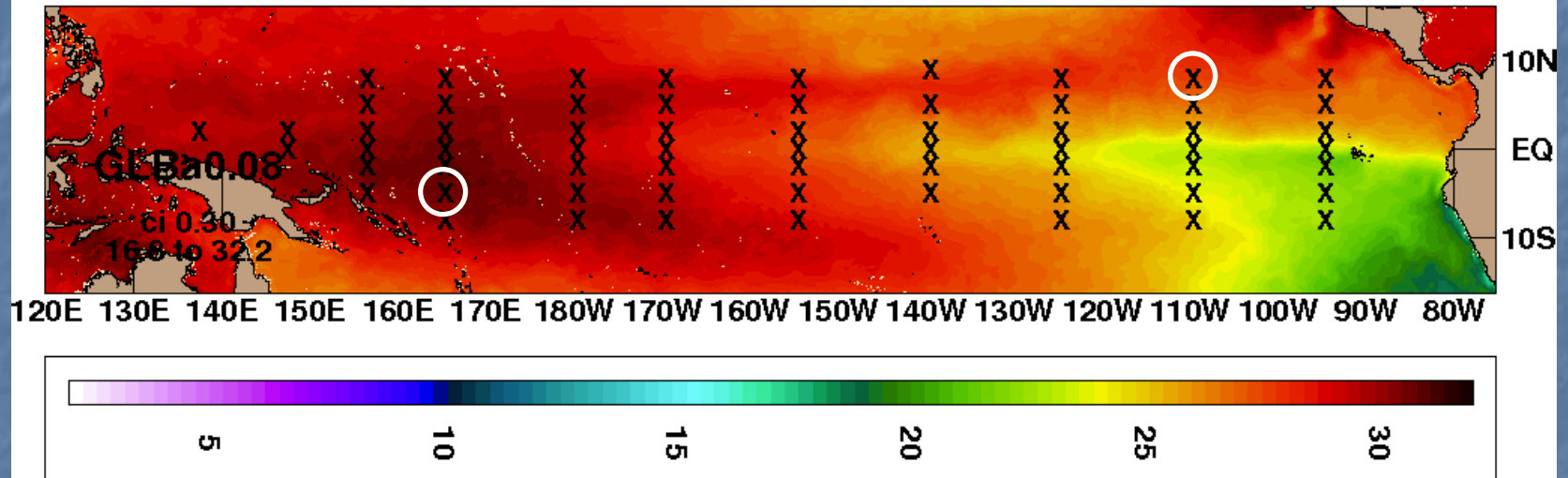
## SSH and surface drifters



# Vertical Temperature Profiles

## Locations of TAO buoys

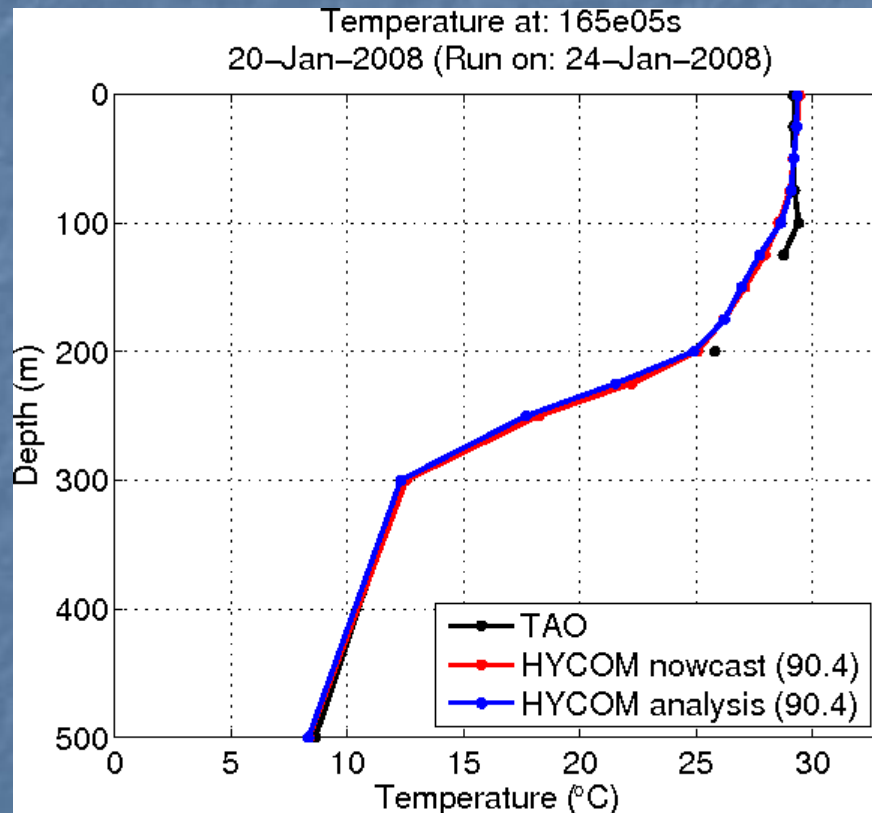
Mean sea surface temperature January 2004 (60.5)





# Vertical temperature profiles

5°S 165°E



8°N 110°W

